An Open Letter to the Custodians of Scientific Dignity

(Filed under: Friendly Administrative Suggestions)

To the Office of the President and Fellows of Harvard College,
and to any respectable scientific institution in Boston, Washington, or thereabouts,
still operating under the assumption that astronomy is not a television genre:

We write with admiration, concern, and a modest proposal.

Admiration, first, because Harvard has for centuries managed the delicate art of distinguishing speculation from spectacle. Concern, second, because this distinction appears to be experiencing what engineers would call "structural fatigue." And a modest proposal, because history shows that polite letters are cheaper than repairs.

When a full Professor of Astronomy—bearing the imprimatur of Harvard University—begins to publicly entertain explanations better suited to late-night cable programming than to celestial mechanics, one is compelled to ask whether the institutional telescope has been pointed slightly too far toward the entertainment district.

We hasten to clarify:curiosity is a virtue. Imagination is essential. But when imagination begins to audition for prime time, it is customary to offer it a dignified exit ramp.

Thus, we respectfully propose early retirement for Professor Avi Loeb, not as punishment, but as preservation. Preservation of Harvard's reputation. Preservation of astronomy's dignity. And preservation of Professor Loeb's legacy, before it is accidentally syndicated between *Ancient Astronauts* and *Aliens: The Return of the Return.*

This recommendation is made in the same spirit with which one removes a beloved actor from the stage before the audience begins to cough. Not because the actor lacks talent, but because the play has ended.

Let us be clear:the universe is strange enough without needing scriptwriters. Interstellar objects are puzzling without requiring antennas. And physics, when left to its own devices, produces wonders far more interesting than speculation dressed as revelation.

Harvard has always known when to draw a line. We trust it remembers where the chalk is kept.

With the highest respect, and the mildest possible alarm,

Signed,

Concerned Practitioners of Physics
Who Prefer Their Astronomy
Without Commercial Breaks

3I/ATLAS: A Courteous Reply to Avi Loeb

(When Nature Breaks the Comet Manual)

Carlos Omeñaca Prado

Why This Paper Exists

There are moments in science when a distinguished colleague politely knocks on the door and says, "Something does not add up here." Avi Loeb has done precisely that with 3I/ATLAS.

To his credit, he does not shout. He does not accuse. He does not immediately reach for little green men with soldering irons.

Instead, he lists facts.

Unfortunately, facts have a bad habit:when placed side by side, they sometimes begin to whisper to one another, and the whisper is rarely flattering to our favorite models.

This paper exists for a simple reason. When a senior professor of astrophysics publicly suggests that our standard explanations are stretched thin, we should either mend the fabric or admit it no longer fits. Adding decorative patches labeled "exotic but natural" does not count as tailoring.

We will therefore do something unfashionable: we will take each anomaly of 3I/ATLAS at face value, and we will resist the temptation to solve each one with a different miracle.

No speculation about alien technology will be required. No speculation about alien stupidity either.

Only physics.

The First Anomaly: Activity Before the Sun Has a Say

Comets, as every undergraduate learns, are polite objects. They wait for the Sun to warm them before they begin to misbehave.

3I/ATLAS did not receive the memo.

Its activity began at heliocentric distances where solar heating is less an instruction and

more a suggestion. Water ice, being a law-abiding molecule, remains stubbornly solid there. Invoking it would be like blaming melted butter in a freezer.

The usual rescue operation is swift and familiar: *"It must be CO or CO_2."*

Indeed, it might be. But this explanation quietly assumes something rather important:that these volatiles are not only present, but mechanically available, permeable, and capable of venting without first shattering the object.

This is not chemistry. This is **mechanics**.

A volatile trapped beneath a stressed crust does not sublimate politely. It waits, stores energy, and fails catastrophically.

Early activity is therefore not merely a question of composition. It is a question of **how the object is built**.

This distinction will matter.

Very much.

The Second Anomaly: Production Curves That Refuse to Behave

If comets are polite, then their production curves are downright Victorian. They rise smoothly as the Sun approaches, they fall smoothly as it departs, and they do so with the quiet dignity of a well-trained function of r^{-n}.

3I/ATLAS, once again, declined the invitation.

Its production curves kink, bend, flatten, and then resume as if nothing had happened. These are not statistical hiccups. They are structural pauses.

One may, today, open the standard toolbox and find several comforting instruments:

- delayed sublimation,
- heterogeneous composition,
- shadowing effects,
- rotation-induced modulation.

Each works beautifully. Each works **alone**.

The problem is not that these mechanisms fail. The problem is that invoking them **one by one** produces an object that behaves as if it were assembled by committee.

A comet whose activity is controlled by sunlight alone does not stop mid-sentence to clear its throat. A body under internal stress does.

Broken slopes in $Q(r)$ are not signatures of exotic molecules. They are signatures of **thresholds**.

A crust does not yield continuously. It yields when it can no longer pretend.

The Third Anomaly: Volatile Ratios That Break Local Chemistry

The ratio $Q(CO_2)/Q(H_2O)$ of 3I/ATLAS is often described as "unusual." This is a polite word meaning, "We do not see this at home."

One may argue that interstellar objects are, in general, not obliged to resemble our neighbors. This is correct, and also insufficient.

A ratio is not merely a census of molecules. It is a **thermodynamic confession**.

High CO_2 relative to H_2O does not merely imply abundance. It implies accessibility, transport, and release.

In other words, it implies that the object's internal structure allows CO_2 to escape without first dismantling the entire body.

That is not a chemical statement. That is an architectural one.

Chemistry tells us what *could* exist. Mechanics tells us what is *allowed to leave*.

The standard model answers the first question admirably. It remains evasive on the second.

The Fourth Anomaly: Jets With Memory

Jets are directional. This is not surprising.

Jets that remain directional, coherent, and stubbornly repetitive are another matter.

3I/ATLAS exhibits activity that prefers certain orientations, as if the object remembers where it has been hurt before.

Sunlight does not have a memory. Fractures do.

Persistent anisotropy implies one of two things:

- a rotating lighthouse of composition (which must somehow remain aligned), or
- a mechanically scarred body whose weaknesses are written into its structure.

The first option requires fine-tuning. The second requires only stress.

Nature, in our experience, has an aversion to fine-tuning but a deep affection for cracks.

The Fifth Anomaly: Polarization and Dust That Did Not Grow Up Here

Polarization is often treated as a decorative footnote, which is unfortunate, because light is an excellent gossip and a terrible liar.

In the case of 3I/ATLAS, it talks.

The dust scatters light in a manner suggesting grains with unusual size distributions, aggregation states, and surface properties—grains that have lived through pressure, compression, and decisions they did not make lightly.

At this point, the familiar chant is usually invoked: *"Different formation environment."*

Indeed. But environments do not act magically. They act mechanically, thermally, and historically, and they leave marks.

Dust remembers how it was compressed, how it was fractured, and how it was finally released. Polarization is therefore not a fingerprint of chemistry alone. It is a fingerprint of **processing history**.

This dust did not merely come from elsewhere. It came from elsewhere **and stayed there long enough to acquire bad habits**.

Why Stacking Ad-Hoc Explanations Is Still Not an Explanation

Here is where patience begins to wear thin.

Each anomaly, considered in isolation, admits a respectable, sober, peer-reviewed explanation. There is no scandal in any single one.

The difficulty appears when every anomaly requires its own personal excuse.

One mechanism for early activity. Another for broken slopes. A third for volatile ratios. A fourth for jets. A fifth for dust.

At some point, this stops looking like physics and starts looking like diplomacy.

When a single object demands five unrelated explanations, the reasonable suspicion is not that the object is bizarre, but that the question has been framed incorrectly.

3I/ATLAS is not misbehaving. It is being misdescribed.

A Single Physical Parameter You Did Not Name

You were careful. You listed anomalies precisely. You resisted premature conclusions.

But one physical parameter remains conspicuously absent from the discussion.

Suppose the object's **internal mechanical state**—its stress, cohesion, and pressure history—is not universal, but inherited from the large-scale environment in which it formed.

Then the picture simplifies abruptly.

- Early activation becomes a pressure mismatch.
- Broken $Q(r)$ curves become stress-release events.
- Volatile ratios reflect trapped versus free phases.
- Jets trace persistent fracture geometry.
- Dust polarization records long-term processing.

Five anomalies. One cause.

No engineers required.

Only memory.

3I/ATLAS Without Engineers

When unfamiliar physics appears, the modern reflex is binary:

- either nothing is wrong,
- or someone built it.

History suggests a third option has a better track record.

We forgot something.

3I/ATLAS does not behave like a local comet because it is not one. It behaves like a body that crossed a boundary it was never meant to cross quietly.

The Sun did not awaken it. The Sun **challenged it**.

Once this is allowed, the anomalies stop arguing with one another. They fall into line.

And that, for a physicist, is usually the end of the mystery.

Not the beginning of aliens.

Carlos Omeñaca Prado